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END SEMESTER RETEST EXAMINATION

May/June – 2026

Semester : 6th (Old)

Branch : Civil Engineering

Subject Code : CV-601

Subject Name : DESIGN OF STEEL STRUCTURES

Full Marks – 70

Time – Four hours

The figures in the margin indicate full marks for the questions.

(Assume any missing data suitably.)

Instructions :

(i) Objective Question Nos. 1, 2 and 3 are compulsory.

(ii) Answer any *five* questions from the rest.

1. Fill in the blanks : 1×5=5

(a) Steel has _____strength to weight ratio.

(b) Structural rolled steel is designated by the _____ and _____ of their cross-section.

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(c) Rolled steel square bars are designated by _____.

(d) "Minimum Design Loads for Buildings and Other Structures" are specified in IS: _____.

(e) Limit State Method (LSM) takes care of both_____and _____requirements.

2. Choose the correct answers : 1×5=5

(a) For a 25 mm dimeter rivet, the rivet hole should be made larger by

(i) 1.0 mm (ii) 1.5 mm

(iii) 2.0 mm (iv) 2.5 mm

(b) The calculated shearing strength, bearing strength and tearing strength for a riveted joint are 80 kN, 60 kN and 40 kN respectively. If the tensile force on the joint is 240 kN, the number of power driven shop rivet required for the joint is

(i) 3 (ii) 4

(iii) 6 (iv) None of these

(c) The beam section which can develop plastic hinges and have rotation capacity required for failure of the structure by formation of plastic mechanism is known as

(i) Plastic section

(ii) Compact section

(iii) Semi-compact section

(iv) Slender section

(d) Two steel plates 10 mm and 12 mm thick are to be connected by fillet weld, the minimum size of welds required is

(i) 8 mm (ii) 6 mm

(iii) 5 mm (iv) 3 mm

(e) For a 16 mm diameter bolt, the diameter of bolt hole required is

(i) 17 mm (ii) 18 mm

(iii) 19 mm (iv) 20 mm.

3. Define the following : $1 \times 5 = 5$

(a) Lug angles (b) Slenderness ratio

(c) Net-sectional area (d) Gusset

(e) Column base.

4. (a) Write down the assumptions made for design of riveted joint. 4

(b) Find the number of power driven rivets required to connect two plates 12 mm and 16 mm thickness by double riveted double cover butt joint with 20 mm rivets at a pitch of 100 mm. Take τ_{vf} = 100 N/mm², σ_{pf} = 300 N/mm² and σ_{at} =150 N/mm². 7

5. A member of a roof truss consists of 2ISA 100 × 100 ×10 mm, placed back to back on both sides of a gusset plate of 12 mm thickness. Design a riveted joint to carry a load of 80 kN. Also find the pitch and draw a neat sketch of the joint. Take τ_{vf}=100 N/mm², σ_{pf}= 300 N/mm² and σ_{at} =150 N/mm². 6+5=11

6. (a) What do you mean by bearing and friction type of bolts ? 2

(b) Write down at least six advantages of bolted connections. 3

(c) Calculate the strength of a 16 mm diameter bolt of grade 4.6 when it is used in a single cover butt joint. The main plate and cover plate being 14 mm and 10 mm thick respectively. 6

7. (a) List at least six advantages of welded connections over riveted connections. 3

(b) Determine the size and length of fillet weld for a lap joint to transmit a factored load of 120 kN. The width of two plates to be joined are 80 mm and 120 mm. Thickness of plates is 10 mm and the overlap is limited to 100 mm. 8

8. Determine the design tensile strength of ISA 90 × 90 × 10 mm which is connected to a 12 mm thick gusset plate at the ends with 3 nos. of 16 mm diameter bolts. The yield strength and ultimate strength of the steel used are 250 MPa and 400 MPa. Assume edge distance =30 mm and pitch = 60 mm. 11

9. Design a double angle discontinuous strut to carry a factored load of 120 kN. The length of the strut is 3.0 m between intersections. The two angles are placed back to back of a 12 mm thick gusset plate. Use steel of grade Fe 410. 11

10. Determine the design bending strength for the beam of ISHB 450 @ 0.907kN/m considering the beam islaterally supported. The unsupported length of the beam in 3.0 m. Assume steel grade of Fe410 and the design shear force V is less than the design shear strength. 11

11. A column ISHB 300 @ 618 N/m is used to carry a factored load of 1200kN. Design a suitable slab base plate for the column to support the loadsafely. Assume Fe410 grade steel and M20 grade concrete. 11